Exhibit 12
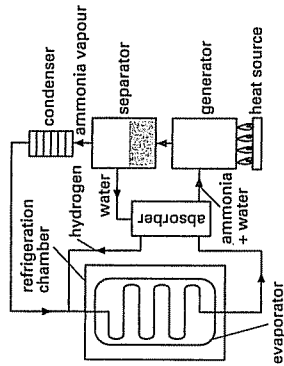
THIRD EDITION

The Penguin Dictionary of
PHYSICS
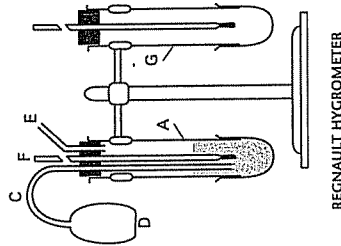
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regelation

refrigerant, usually ammonia in a water solution, is drawn through the evaporator by a stream of pressurized hydrogen. It then passes to the heated generator, from which the ammonia and water vapour are led to a separator. The ammonia vapour separates here from the water and passes to the condenser, where it gives off its heat to the surroundings, becoming a liquid. The liquid ammonia is then mixed with the hydrogen gas, which carries it to the evaporator again. An absorber, between the evaporator and the heated generator, uses the water from the separator to dissolve the ammonia vapour before it enters the generator.

regelation If two blocks of melting ice are pressed firmly together the increase in pressure lowers the melting point and so the ice at the contact faces melts, taking its latent heat from the neighbouring ice whose temperature thus falls below 0 °C. When the pressure is removed the film of water previously formed freezes, giving its latent heat to the neighbouring ice and thus joining the two blocks into a single block of ice. This process is known as regelation.

regenerative braking See ELECTRIC BRAKING.

regenerative cooling A process used, e.g. in the UNDE PROCESS for liquefying air, in which compressed gas is cooled by expansion through a nozzle and the cool expanded gas is used to cool the oncoming compressed gas in a heat exchanger before it is cooled by expansion.

Diagram labels: refrigeration chamber, condenser, ammonia vapour, separator, hydrogen, water, generator, heat source, absorber, ammonia + water, evaporator

b *Vapour-absorption cycle*

Regge trajectory of two REGGE POLES, mass being given in brackets

Graph labels: ρ-trajectory, spin, mass² [(GeV/c²)²], ρ(765), ρ(1660), ρ(2290); Nₐ-trajectory, spin, mass² [(GeV/c²)²], N(938), N(1688), N(2220)

Regge pole model A theoretical model used to describe the scattering of ELEMENTARY PARTICLES at high energies. In general, it is found that the STRONG INTERACTIONS involved in such processes cannot be described in terms of the exchange of a single elementary particle. Although the contribution from the exchange of low-mass particles is usually the most important contribution to the SCATTERING AMPLITUDE, the contributions from the exchange of the higher-mass resonances cannot be neglected. Mathematically it is possible to describe the collective effect of exchanging all these particles in terms of the exchange of a few objects called Regge poles whose SPINS increase with their effective masses. The path traced out by the spin of a Regge pole as its "mass" varies is called a *Regge trajectory*. On a graph of spin against the square of the mass (see diagram), Regge trajectories are found to be approximately straight lines. The individual particles represented by a Regge pole have all quantum numbers the same except for their spins, which differ by $\Delta J = 2n$, where n is an integer.

register A semiconductor device that acts as a storage location in the processing unit

of a computer. A register usually stores a single WORD or sometimes a BYTE or BIT, the information being held only temporarily before it can be operated on. Storage and retrieval of the information must be extremely rapid. A register thus normally consists of a group of FLIP-FLOPS, each storing one bit.

REGNAULT HYGROMETER

Regnault hygrometer A HYGROMETER of the dew-point type consisting of two silver vessels A and G (see diagram), mounted side by side. Air may be blown from D through a tube C dipping into ethoxyethane (ether) contained in A. This causes the ether to evaporate through E thus cooling the tube A until eventually, at the dew point, moisture condenses on the outside of A giving it a dull appearance compared with the surface of G. This temperature, and that at which the dullness disappears on allowing the apparatus to stand, are noted on the thermometer F, the mean giving the dew point; this, in conjunction with the room temperature, enables the relative humidity of the air to be calculated.

regulation Of electrical generators, transformers, and power transmission lines. The changes that take place in the available voltage due to internal resistance (for direct current) or to internal impedance (for alternating current) when the load is changed under specified conditions.

rejector A parallel RESONANT CIRCUIT. The IMPEDANCE of a circuit comprising inductance and capacitance in parallel has a max-

relativistic particle

imum value at one particular frequency. The maximum impedance is called the *dynamic impedance*. Compare ACCEPTOR.

relative aperture See F-NUMBER.

relative atomic mass Symbol: A_r. The average mass per atom of a given specimen of an element, expressed in unified ATOMIC MASS UNITS. The value depends on the isotopes present in the specimen. The natural isotopic composition is assumed unless otherwise stated. Formerly called *atomic weight*.

relative density See DENSITY.

relative-density bottle A small flask with a perforated glass stopper that may be completely filled with a liquid. In order to determine the relative DENSITY of the liquid, the bottle is weighed empty (m_1), full of liquid (m_2), and finally, full of water (m_3). The relative density of the liquid is then

$$(m_2 - m_1)/(m_3 - m_1).$$

Ingenious modifications of the procedure enable the relative density of powders, and of quantities of liquid insufficient to fill the bottle, to be found. Compare PYKNOMETER.

relative humidity See HUMIDITY.

relative molecular mass Symbol: M_r. The average mass of a molecule or other molecular entity, expressed in unified ATOMIC MASS UNITS. It is equal to the sum of the RELATIVE ATOMIC MASSES of the constituent atoms. Formerly called *molecular weight*.
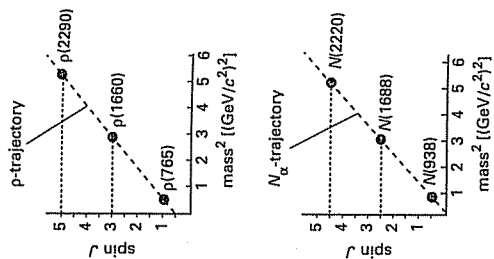
relative permeability See PERMEABILITY.

relative permittivity See PERMITTIVITY.

relative pressure coefficient See PRESSURE COEFFICIENT.

relative velocity The velocity of A relative to B is the velocity that B, supposing himself at rest, assigns to A. If A and B are moving in the same direction the relative velocity of A to B is $v_A - v_B$; if moving in opposite directions, it is $v_A + v_B$. This only applies when v_A and v_B are very small compared to the speed of light. See RELATIVITY.

relativistic particle A particle the speed of which is comparable to a particular ob-